English

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exocad

# Instruction Manual

## Creating Implant Libraries for exocad DentalCAD

exocad.com

**Instruction Manual by exocad GmbH**

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# 1 Introduction

This document covers the process of creating an implant library from previously generated STL files and gives instructions for all necessary steps.

The exoImplantEditor is an editor for exocad's `config.xml` implant library format, with an additional mesh analysis functionality. In order to use the exoImplantEditor, you need an exocad dongle which is activated to work with exocad DentalCAD Engine Build 4652 or later.

After creating an implant library, we strongly recommend to have it signed by exocad (see Chapter 9). This ensures the correctness and compatibility of the library.

# 2 Input Data and Requirements

You need a complete set of suitable implant geometries as STL files to be able to use the exoImplantEditor. Please see the document *Instruction Manual – Creating Implant Geometries for exocad* (customer.exocad.com/exocad_Instruction_Manual_Creating_Implant_Geometries-en.pdf) for details on requirements for the implant geometries.

If you have problems generating suitable geometries using your industrial CAD software, the exoImplantEditor will not solve these for you. However, the exoImplantEditor's automatic mesh analysis / reporting functionalities can help you troubleshoot and understand what exactly are the issues.

## 2.1 Filename Conventions for STL Meshes

Only the following characters are allowed in filenames of STL meshes:

- small/capital Latin letters
- numbers
- _ and -
- . (points)

**All other characters are NOT allowed and will lead to the library not being signed!**

# 3 Using the exoImplantEditor

## 3.1 Launching the exoImplantEditor

**Step 1:** Download the exoImplantEditor from the Documentation&Tools section in the Secure Area of our website exocad.com/secure-area/documentation-tools.

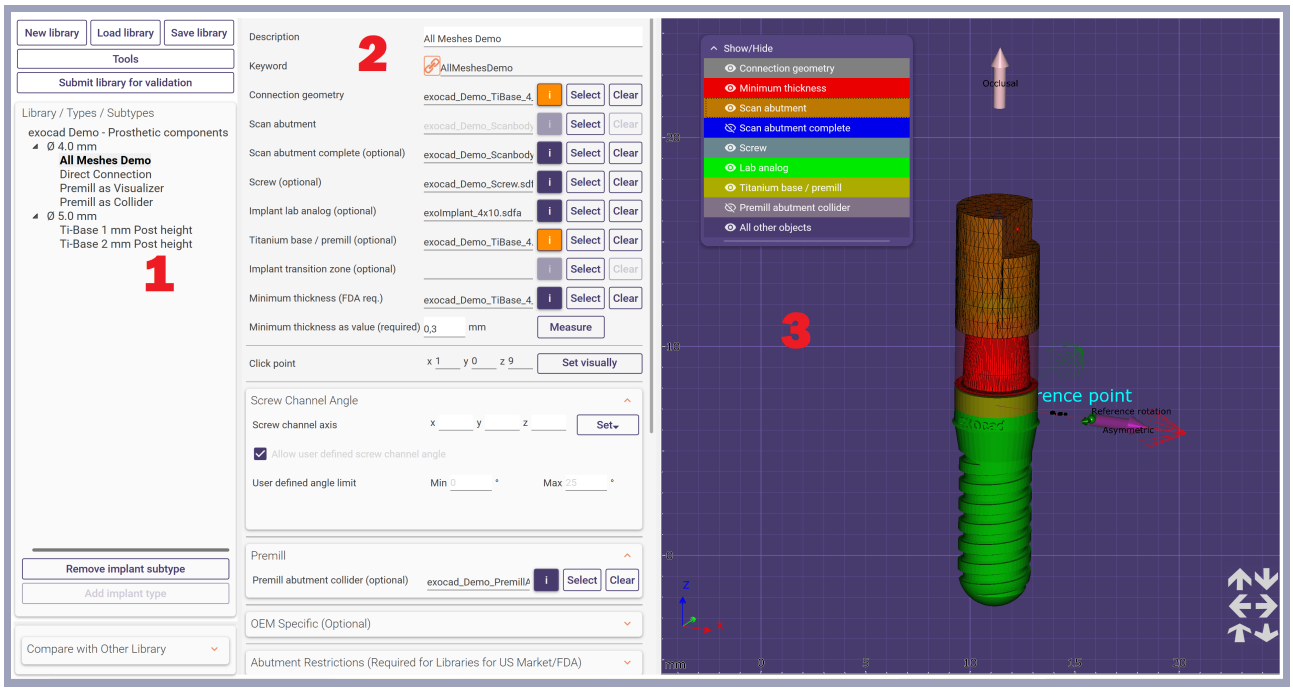
**Step 2:** Unpack the exoImplantEditor zip file in a directory of your choice.

**Step 3:** Run the `ExoImplantEditor.exe` file.



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## 3.2 The exoImplantEditor Window




The exoImplantEditor window consists of three parts:

- **Actions/Hierarchy Section [1]:** Action icons and library structure
- **Information Section [2]:** Section to enter and display information/parameters
- **View Section [3]:** Display of objects, e.g. geometries

## 3.3 Navigation in the View Section

| Function | Description |
|---|---|
| Scroll mouse wheel | Zoom in/out (zoom center = mouse position). |
| Hold right mouse button and drag | Rotate the view around the rotation center (object center by default). |
| Right-click outer frame and drag | Rotate the view using the view axis around the rotation center (object center by default). |
| Click middle mouse button / mouse wheel | Center the view and set a new rotation center. |
| Hold both mouse buttons and drag | Move the view freely. |
| `Num1,2,3,4,6,8` (Numpad activated) | Set view to top, frontal, etc. |



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### 3.3.1 Show/Hide Objects

In the upper left corner of the View Section, available objects for display are listed, each with an eye symbol (see Figure 1). Show/hide objects by clicking the eye symbols. You can change the transparency of an object by using the corresponding line in the list as a slider.

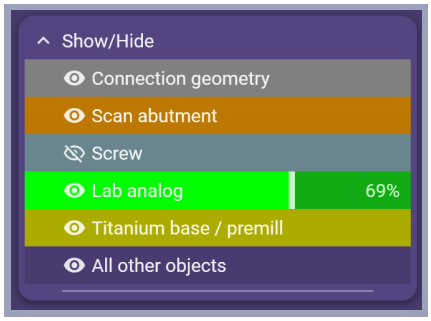



Figure 1: Object list in View Section

### 3.3.2 Context Menu

Access the context menu by right-clicking an object.

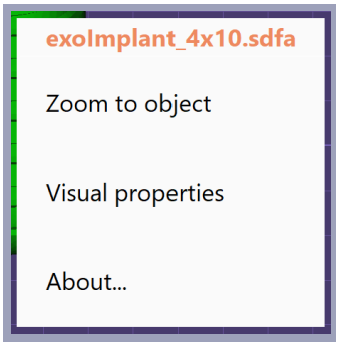



Figure 2: Context menu

| Function | Description |
|---|---|
| Zoom to Object | Zoom to the selected object. |
| Visual Properties | Set visual properties for the object:<br>● Hide this Object: Hides the object.<br>● Wireframe: Shows the triangle grid of the object.<br>● Point Cloud: Shows the object as point cloud.<br>● Flat Shading Only: Activated by default to visualize the flat areas of a geometry. Deactivation changes the illumination angle, allowing a more realistic visualization of round objects.<br>● Opaque values: Transparency settings.<br>● Line Thickness: Only available if Wireframe and/or Outline is activated. Allows you to define the thickness of lines. |
| About... | Displays software information (version, engine build, copyright information). You can also access this information by right-clicking the background. |



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## 3.4 Tools

Click Tools in the Actions/Hierarchy Section to access available tools.

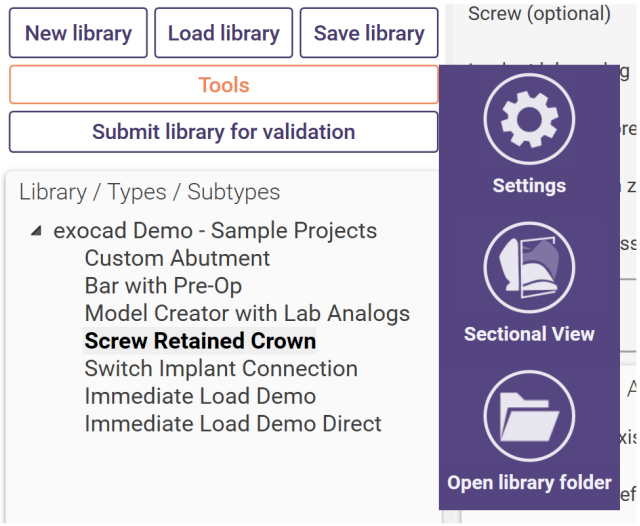



Figure 3: Tools

### 3.4.1 Settings

This tool provides program and view settings.

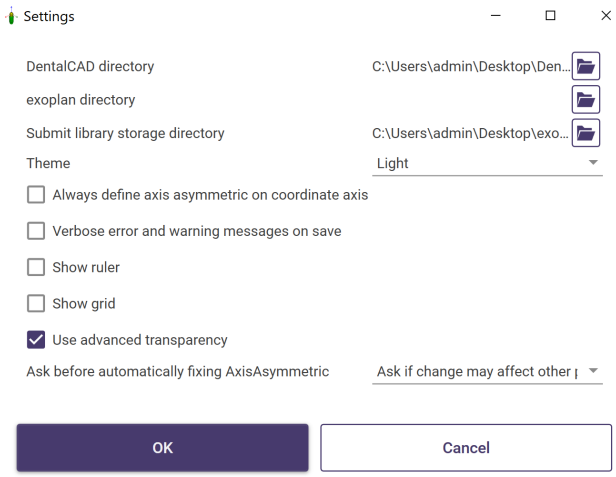



Figure 4: Settings



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### 3.4.2 Sectional View

This tool provides a sectional view for objects and allows you to define clip planes.

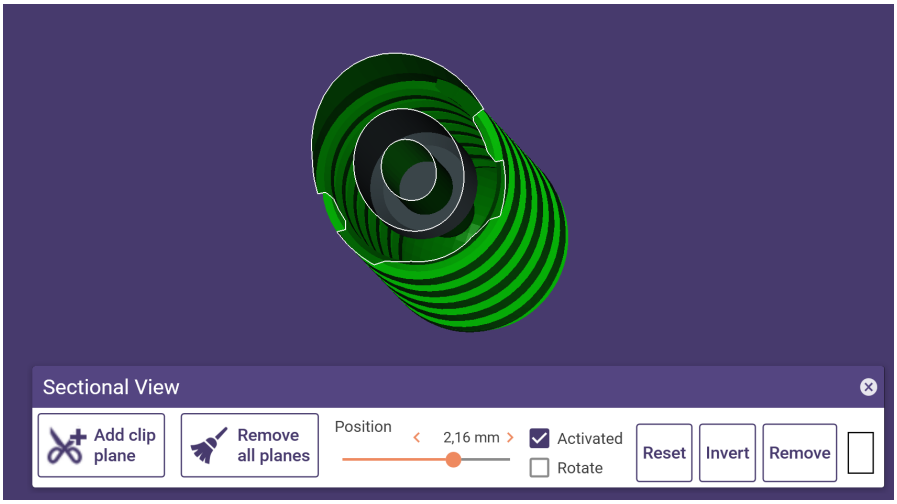



Figure 5: Sectional View

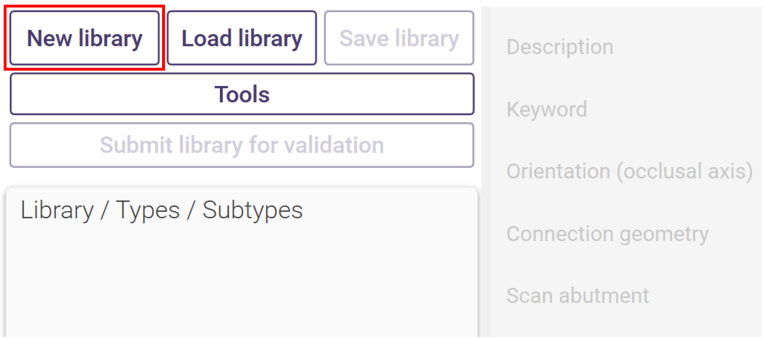
### 3.4.3 Open library folder

Opens the folder where the `config.xml` file and all other files related to this library are stored.

# 4 How to Create a New Implant Library for exocad DentalCAD

## 4.1 Step 1: Select the Library and Save the config.xml File

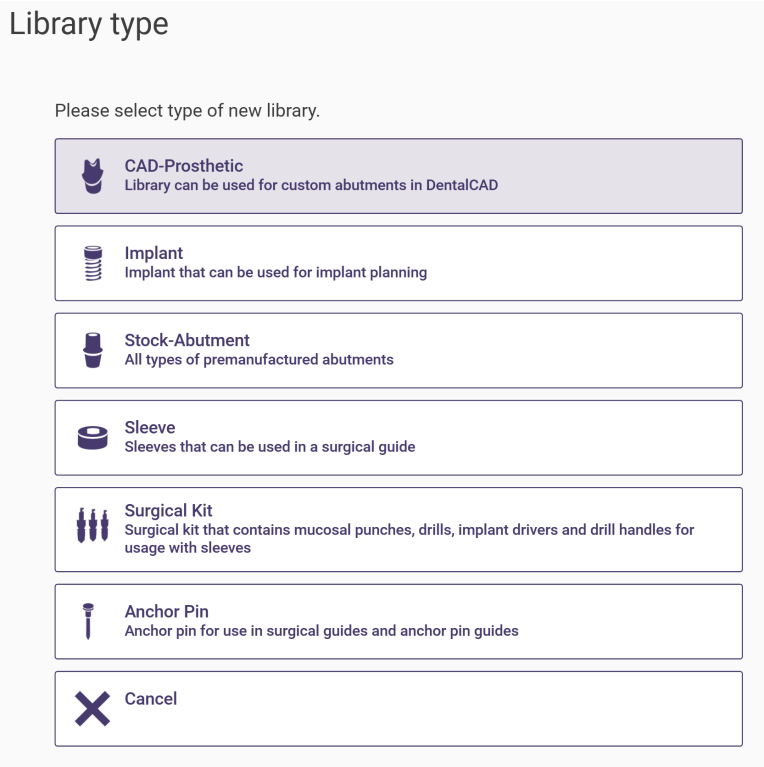
**Step 1:** Click NEW LIBRARY in the View Section of the exoImplantEditor window.




**Step 2:** Select CAD-PROSTHETIC from the list of library types.



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**Step 3:** In the now appearing file explorer window for saving the `config.xml` file, create a new folder for the new implant library in a directory of your choice. Ensure to follow the **naming conventions for implant library folders:**

- The folder name must contain the manufacturer and the name of the implant system.
- The folder name must be machine-readable (no special characters, no umlauts, max. 120 characters, etc.).
- Do not use any filling words (e.g. *System*, *Type*, *Body*, *Implant*, *Library*, *DentalCAD*, etc.).
- The name must not contain any blankspaces. For separation, use underscores _.
- Do not add any body or platform diameter information to the folder name.
- Do not add version information or a revision date to the folder name. You can add version information in the entry provided for this purpose (see Chapter 4.12).

Example for an implant library folder name: `exocad_Demosystem`
(*manufacturer*_*name of implant system*)

**Step 4:** Save the file `config.xml` in the library folder. Do not change this filename!

INFORMATION

Once you have received a signed implant library (and use it in the DentalCAD) with a specific folder name, do not change this folder name anymore. If you want to update an already existing implant library, store it with the same folder name.
An example: If you have a new version of the library `exocad_Demosystem`, do not change the folder name to `exocad_DemosystemV02` or the like. Just replace changed parts and save the new version without changing the folder name.



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## 4.2 Step 2: Enter the Library Description

Enter the library description into the field DESCRIPTION (see Figure 6). This is what will appear in the user interface of the exocad DentalCAD software as implant library title. The library description will also be displayed in the Action/Hierarchy Section.

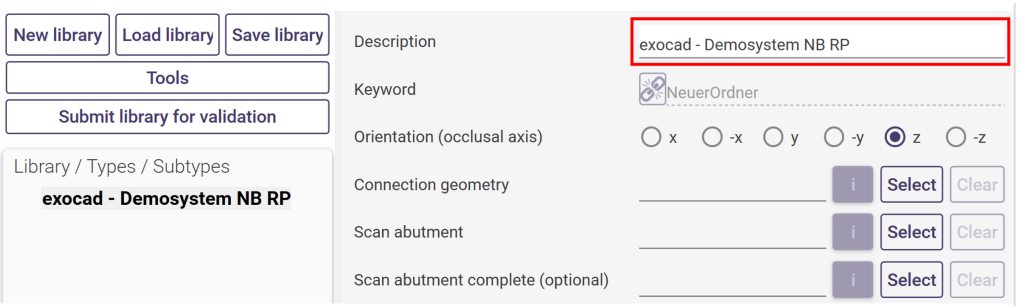



Figure 6: Library description

### 4.2.1 Naming Conventions for Library Description

- The library description should contain the manufacturer and the name of the implant system seperated with -.
- The library description can contain spaces.
- Do not add version information or a revision date to the library description. You can add version information in the entry provided for this purpose (see Chapter 4.12).
- The library description must not contain any special characters but the - sign (also no underscores _), but you can include umlauts and upper-case letters (e.g. trademark symbols).
- Do not use any all-capitalized words (e.g. EXOCAD).
- Use abbreviations for compatible implant systems. exocad provides a list of these abbreviations on request.
- If you mention compatible brand names, make sure to respect brand registration and trademarks by including the correct (®,™, etc.) symbols with the compatible brand name.

Example for a library description: `exocad - Demosystem NB RP`
(manufacturer - implant system with abbreviations for compatible implant systems)

## 4.3 The Library Keyword

Below the library description, the library keyword is displayed. This keyword is generated for referencing purposes.

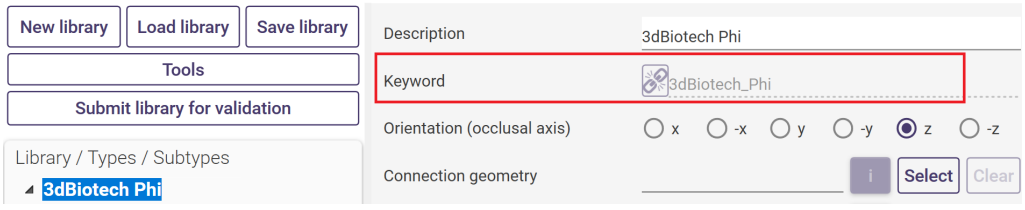



Figure 7: Library keyword top level

At the top level of the library, the keyword is the library's folder name. You cannot edit this keyword. If you have opened an older library in the exoImplantEditor, you will be prompted to set the folder name as library keyword. If you change the library's folder name, the exoImplantEditor will prompt you to confirm the keyword change.



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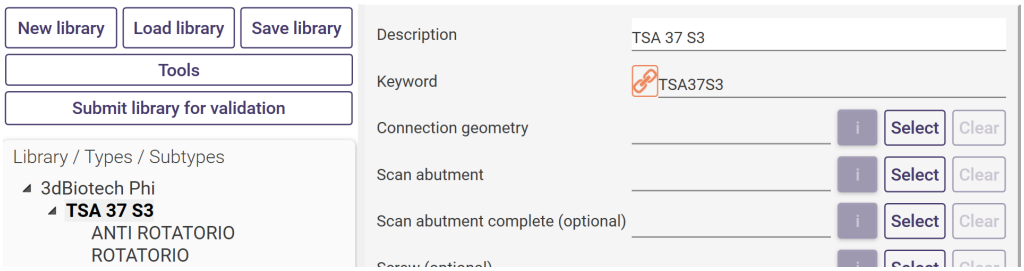



Figure 8: Library keyword lower levels

At lower levels of the library, the keyword is the description of the library entry without spaces and special characters. These entries are editable. To edit the library keyword, click the orange chain symbol. The symbol will change its appearance and the text becomes editable.

## 4.4 Step 3: Select the Connection Geometry File

**Step 1:** Click the SELECT button next to the field CONNECTION GEOMETRY (see Figure 9).

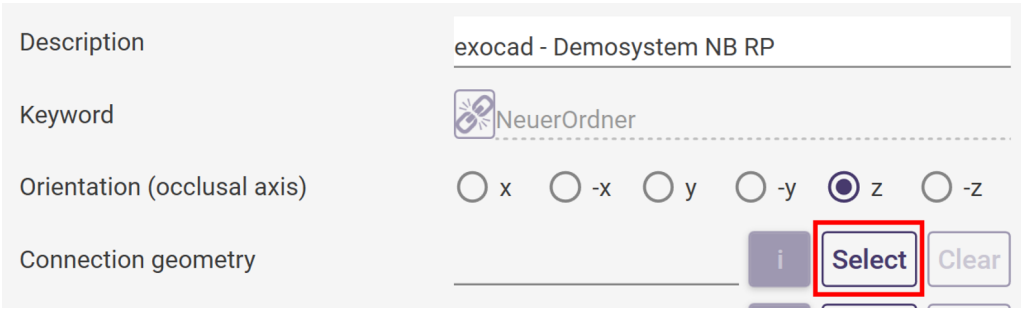



Figure 9: Select connection geometry

**Step 2:** In the appearing file explorer window, select an STL file that meets the requirements specified in Chapter 2. If you are prompted to copy the STL file to the library directory, click YES.

**Troubleshooting: Mesh characteristics**

The exoImplantEditor will perform basic checks of mesh characteristics. If the mesh you have selected is unsuitable or broken, this will usually be detected automatically. In this case, the exoImplantEditor will display an error message, usually together with a visualization of the problem. You cannot edit or save the library until you select a correct geometry. To resolve the situation, please read the error message carefully. Then, correct the mesh so that it meets all requirements.



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## 4.5 Step 4: Select the Scan Abutment File

**Step 1:** Click the SELECT button next to the field SCAN ABUTMENT (see Figure 10).

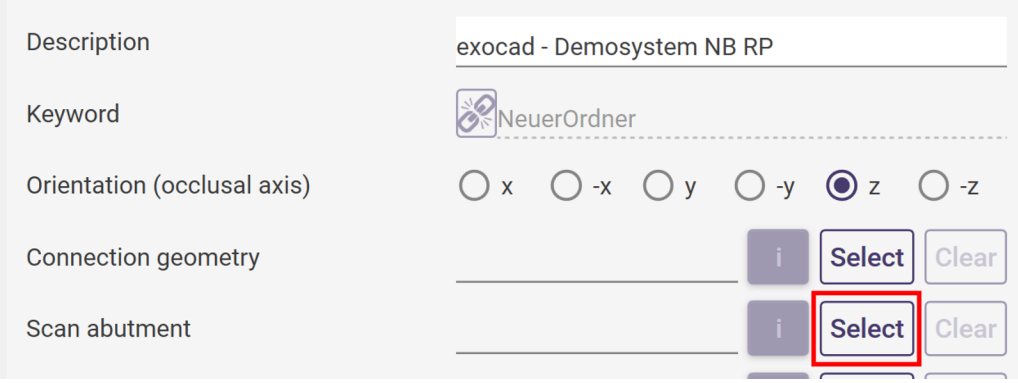



Figure 10: Select scan abutment

**Step 2:** In the appearing file explorer window, select an STL file that meets the requirements specified in Chapter 2. If you are prompted to copy the STL file to the library directory, click YES.

**Troubleshooting: Mesh characteristics & triangle orientation**

As for the connection geometry, basic checks of mesh characteristics will be performed automatically by the exoImplantEditor. The most common issue is too long triangles, so please ensure that your scan abutment mesh is triangulated according to our specifications.

If the outside of the scan abutment is displayed in red, the triangle orientation of the scan abutment is incorrect. You can fix that easily, e.g. by using the free software *Meshlab*.

## 4.6 Step 5: Define the Axis Orientation

Select the implant geometry's orientation from the ORIENTATION (OCCLUSAL AXIS) radio buttons (see Figure 11). The axis you define reflects the occlusal axis of your selected implant data.

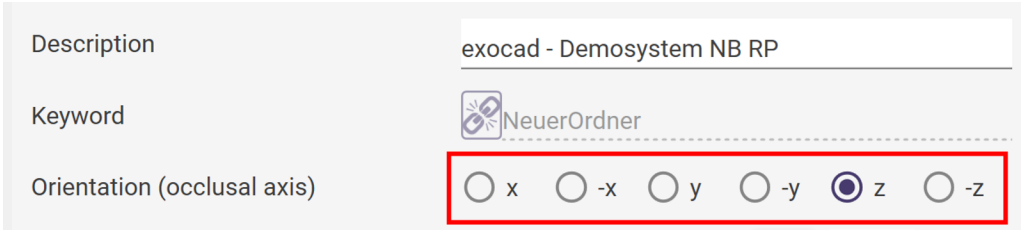
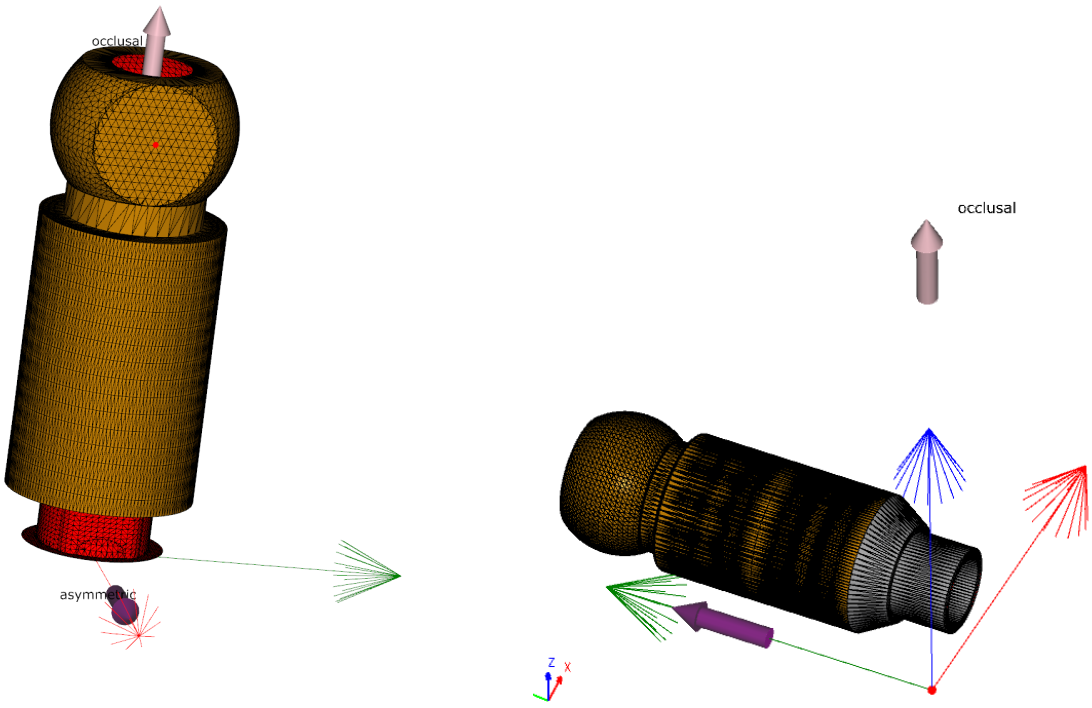



Figure 11: Select orientation

In the View Section, the rose-colored arrow OCCLUSAL must point to the same direction as the screw channel of your implant geometry. Figure 12 shows examples for correctly and incorrectly defined orientation.



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(a) Correct (b) Incorrect

Figure 12: Correctly and incorrectly defined (occlusal) orientation

### 4.7 Step 6: Set a Click Point (for Registration)

**Step 1:** Click SET VISUALLY in the CLICK POINT line (see Figure 13).

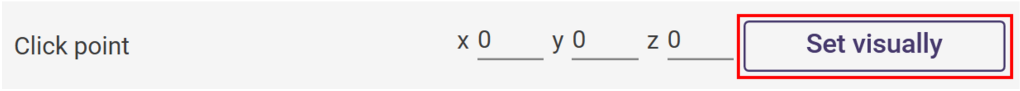
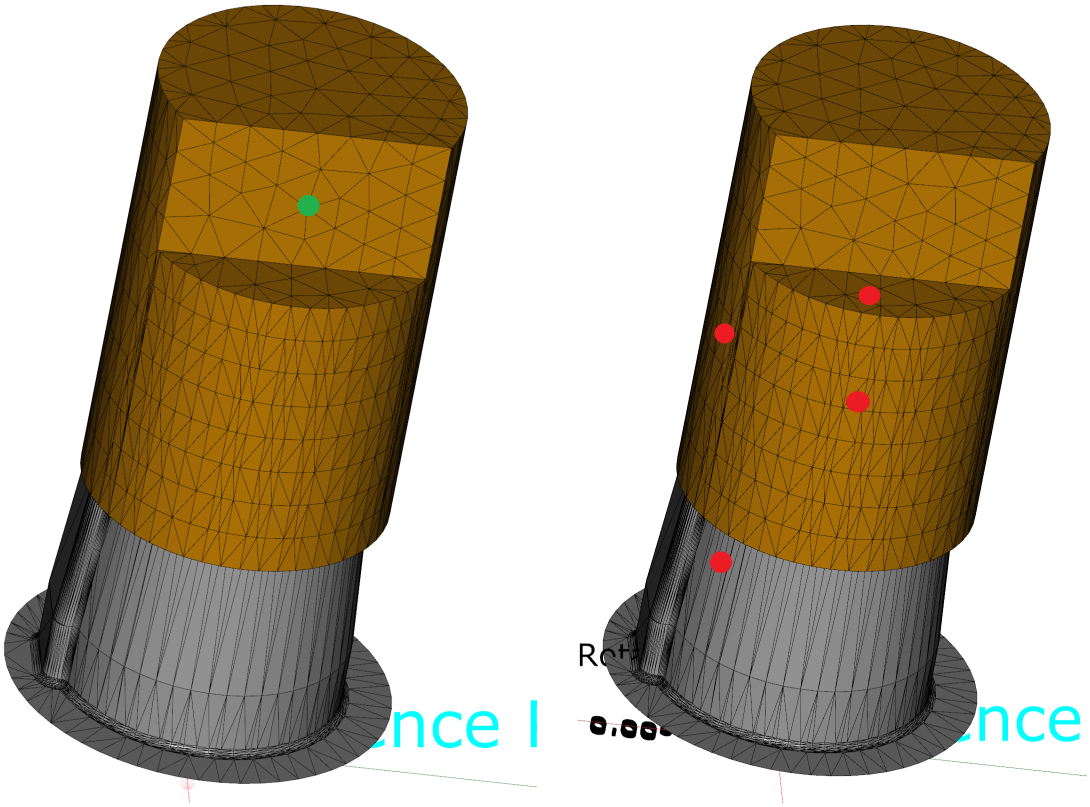



Figure 13: Set click point

**Step 2:** In the View Section, click a characteristic point at the side of the scan abutment. If the scan abutment has a flat side, set the click point on this side. This will be the point the user must click for performing the one-click registration in the exocad DentalCAD software.



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(a) Correct (b) Incorrect

Figure 14: Click point on scan abutment

Once you have set the click point, the ASSYMETRIC arrow will be added automatically orthogonal to the click point position.

### 4.8 Step 7: Check/Uncheck "Invert connection geometry triangle orientation"

The checkbox INVERT CONNECTION GEOMETRY TRIANGLE ORIENTATION (see Figure 15) defines the orientation of the surface normals.

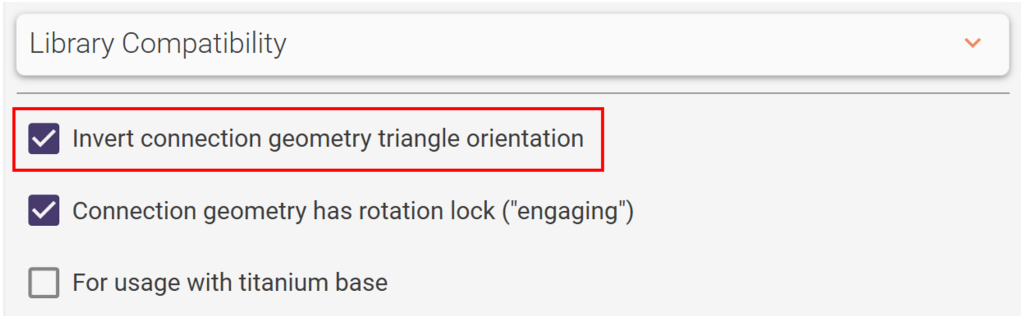
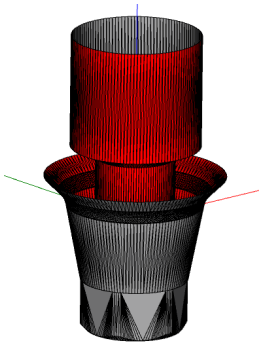
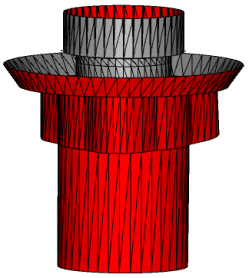
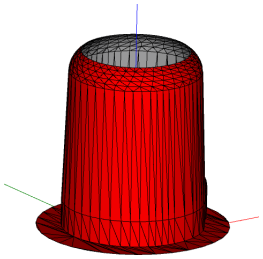
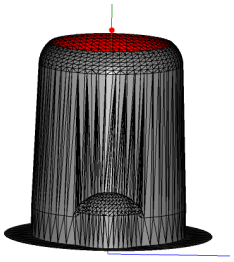



Figure 15: Invert triangle orientation checkbox

It is crucial to set the INVERT CONNECTION GEOMETRY TRIANGLE ORIENTATION checkbox correctly, so that the software knows which part of the mesh is the 'inside' and which part is the 'outside'. To find out the correct setting, view the geometry in the View Section and select the setting according to the table below.



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| Type | Appearance in View Section | Sample picture | Correct setting of checkbox |
|---|---|---|---|
| Direct-to-implant | Screw channel appears red, lower side of the implant geometry appears gray |  | ☑ |
| Direct-to-implant | Screw channel appears gray, lower side of the implant appears red |  | ☐ |
| Direct-to-implant | Both sides appear red, or both sides appear gray | Geometry is broken and cannot be used or must be fixed first. | N/A |
| Using titanium base | Outside of titanium base hull appears red, inside appears gray |  | ☑ |
| Using titanium base | Outside of titanium base hull appears gray, inside appears red |  | ☐ |



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| Type | Appearance in View Section | Sample picture | Correct setting of checkbox |
|---|---|---|---|
| Using titanium base | Both sides appear red, or both sides appear gray | Geometry is broken and cannot be used or must be fixed first. | N/A |

If you do not set the INVERT CONNECTION GEOMETRY TRIANGLE ORIENTATION checkbox correctly, any attempt to use the implant library will lead to broken output data (holes in screw channel in output files).

The INVERT CONNECTION GEOMETRY TRIANGLE ORIENTATION setting is global, and will be applied to all types/subtypes of the implant library. As a result, if you combine several geometries in one library, the orientation of their triangle normals must be consistent.

### 4.9 Step 8: Check/Uncheck Rotation Lock Checkbox

If your geometry has a rotation lock, check CONNECTION GEOMETRY HAS ROTATION LOCK ("ENGAGING").

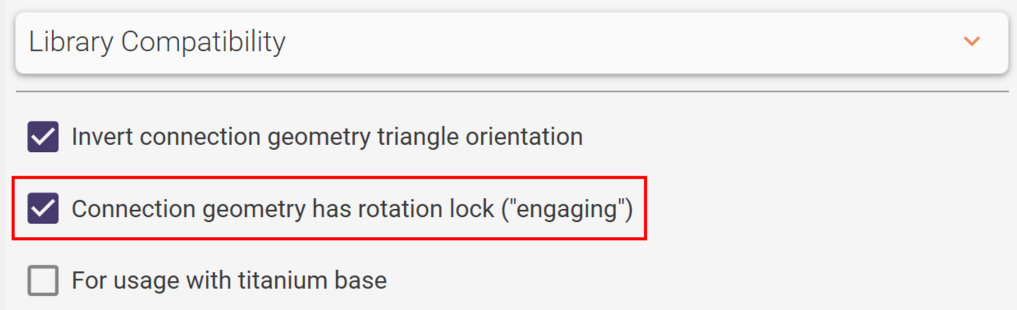



Figure 16: Rotation lock checkbox

### 4.10 Step 9: Define Titanium Base

If your geometry is supposed to be used with a titanium base, check FOR USAGE WITH TITANIUM BASE.

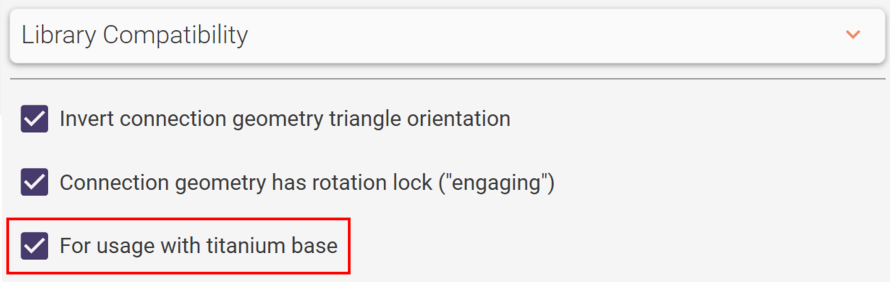



Figure 17: Titanium base checkbox

To load a titanium base mesh, select the corresponding stl file for TITANIUM BASE / PREMILL (OPTIONAL) (see Figure 18). The mesh will be displayed in yellow in the View Section.



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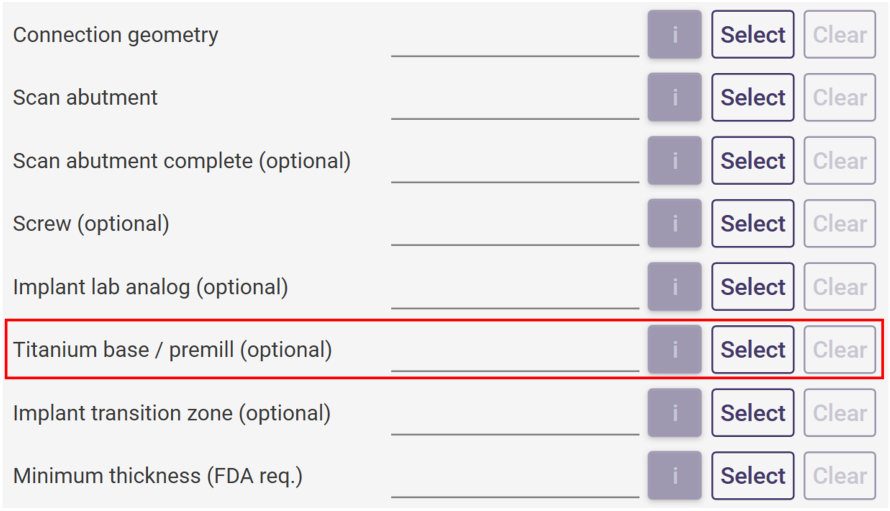



Figure 18: Load titanium base mesh

## 4.11 Step 10: Define Premill

### 4.11.1 For Visualization Purposes

To load a premill mesh for visualization purposes, select the corresponding stl file for TITANIUM BASE / PREMILL (OPTIONAL) (see Figure 18). The mesh will be displayed in yellow in the View Section.

If you are using a premill, **uncheck FOR USAGE WITH TITANIUM BASE** (see Figure 17).

You cannot load/visualize a titanium base mesh **and** a premill mesh, only a titanium base mesh **or** a premill mesh.

### 4.11.2 For Collision Detection

If you want to use a premill for collision detection, load the premill mesh by selecting the corresponding stl file for PREMILL ABUTMENT COLLIDER (OPTIONAL) in the PREMILL section.

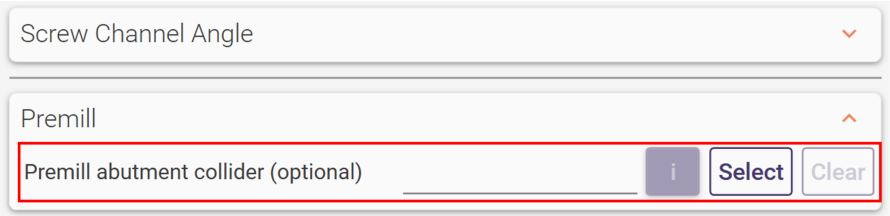



Figure 19: Premill section

The premill abutment collider should represent the maximum premill volume for milling and must be positioned to be connected to the implant connection. Make sure that the premill abutment collider is a cylindrical mesh without holes and open boundaries. It also should not contain the implant connection geometry, as well as the machine holder connection. It's recommended to use a simple volumetric cylinder as a premill abutment collider mesh. Figure 20 shows a correct premill abutment collider mesh displayed in the exoImplantEditor.



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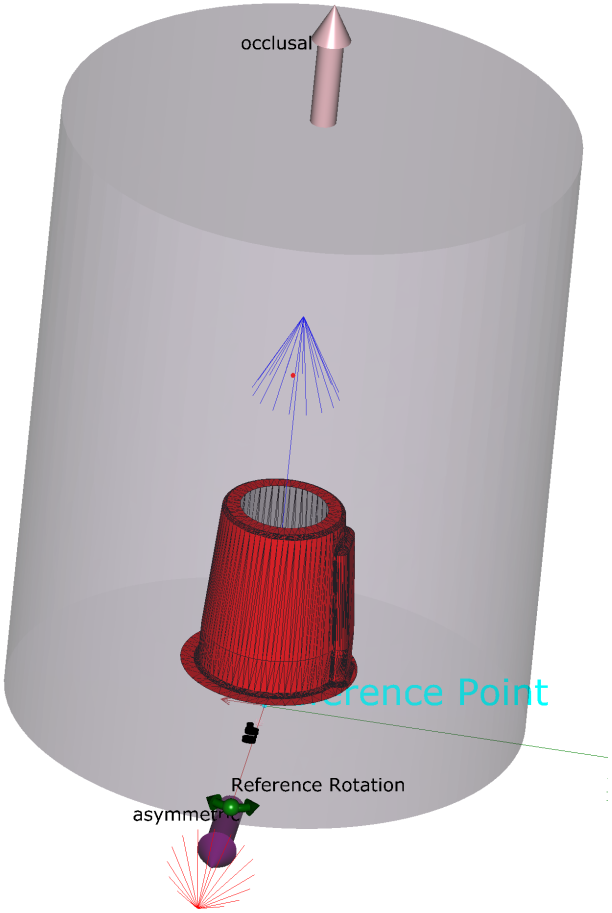



Figure 20: Premill abutment collider mesh with implant connection geometry

INFORMATION

When loading older libraries without premill abutment collider, there is another section Optional information that shows further premill parameters. Those could be entered in previous versions of the exoImplantEditor.

## 4.12 Step 11: Enter Supplier and Legal Information (Mandatory)

Enter supplier and legal information for the library in the bottom part of the Information Section (see Figure 21):

- Supplier name: Name of the implant supplier, including company type (GmbH, AG, Ltd., etc.) and, if applicable, trademark symbols (©, ®, ™)
- Supplier link: URL of the supplier's website (or of the website where the product can be purchased)
- Supplier icon filename: Name of an image file with a supplier icon. Please leave this empty. Supplier icons will be included by exocad staff.
- Legal information: Legal information (e.g. copyrights)
- Warranty information: Default warranty information text (editable)
- Supplier version (optional): You can add version information, e.g. v1, rev1, etc.
- Signature date: Date when the library was signed by exocad. This entry is filled in automatically by exocad during the signing process.



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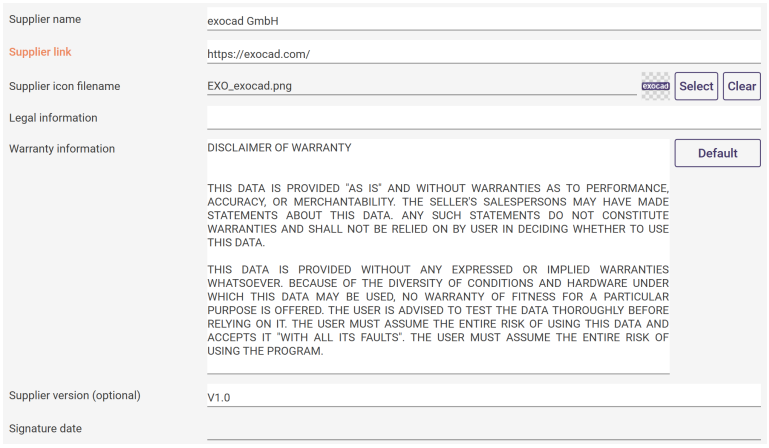



Figure 21: Supplier and legal information

## 4.13 Step 12: Set the Screw Channel Angle

In this section of the exoImplantEditor, you can define angulated screw channels. If you do not set any values here, the screw channel angle is 0° and corresponds to the occlusal axis.

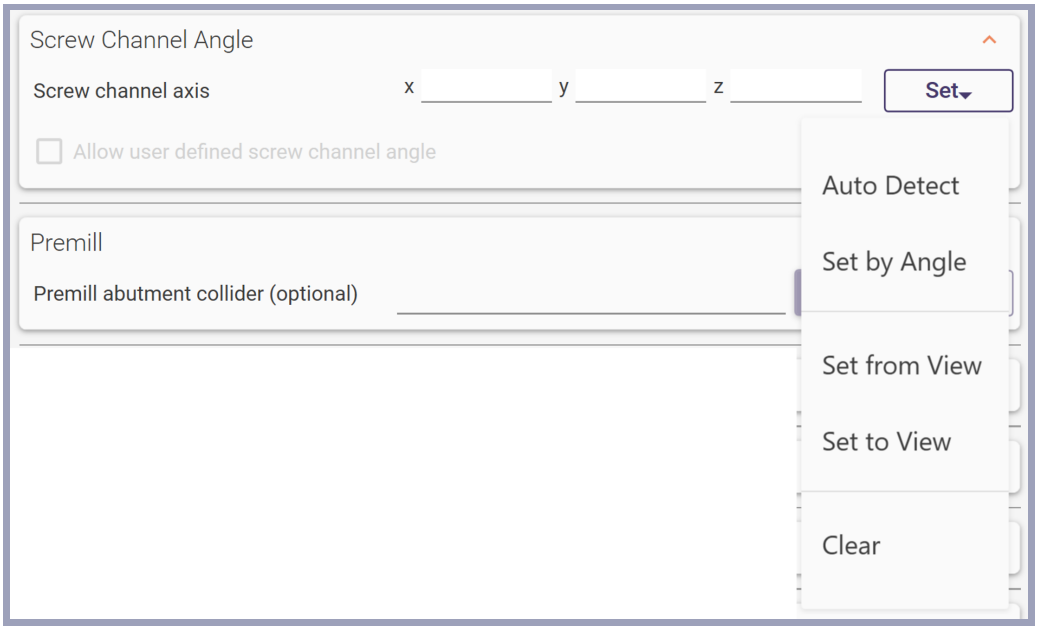
INFORMATION

The visualization of screw channels in the exoImplantEditor is only to indicate the screw channel direction and does not show its correct geometric shape. The geometric shape of the screw channel, as it is generated in the CAD application, is a capsule geometry (as shown in the below figure). If you want to use a round shape for angulated screw channels, please contact the exocad support team. Please note, round channels can lead to the screw not fitting through the angulated screw channel.






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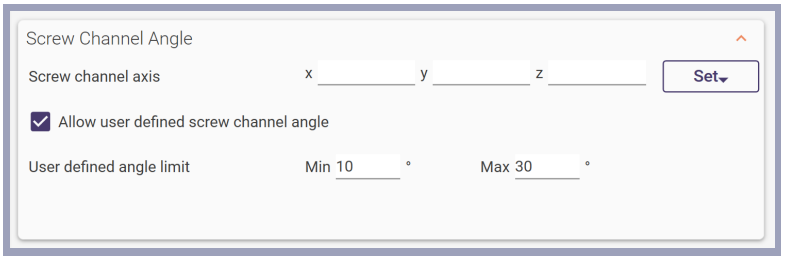



You can define static or dynamic screw channel angles. Static angles are fixed values, whereas dynamic angles allow the user to define screw channel angles within a certain range of values in the CAD application.

To set a static screw channel angle, type in values in the fields X, Y, and Z. Alternatively, use the options in the SET dropdown menu:

- AUTO DETECT: The screw channel is automatically detected as a direct extension of the hole in the abutment's connection geometry.
- SET BY ANGLE: Opens a window to define the desired angle and the rotation axis.
- SET FROM VIEW: Sets the screw channel in current view direction.
- SET TO VIEW: This is a visualization option and does not change the current screw channel definition. Sets the view to the screw channel direction.
- CLEAR: Clears the screw channel.

To set a dynamic screw channel angle, check ALLOW USER DEFINED SCREW CHANNEL ANGLE and enter the value range in the corresponding fields.




In this example, the user can define a screw channel angle between 10° and 30° degrees in the CAD application. If you hover over the field titles, an image appears (see Figure 22), illustrating how the maximum/minimum value you define affects the screw channel angle.



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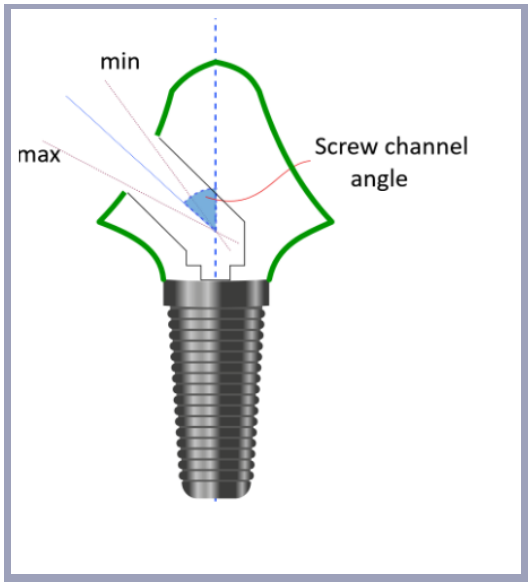



Figure 22: Graphic to illustrate the screw channel angulation

### 4.13.1 Setting Screw Channel Angles for Implants with Direct Connections

If the implant is directly connected to the restoration, the screw channel starts from the top of the connection geometry's surface.

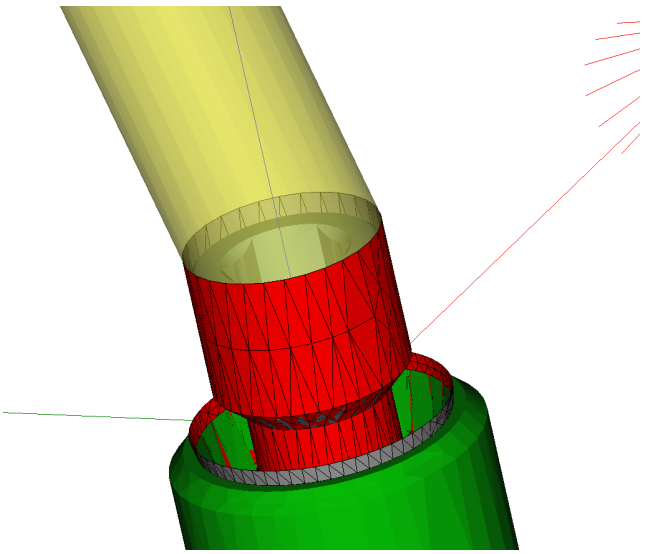


Figure 23: Implant with direct connection, screw channel angle 15°



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### 4.13.2 Setting Screw Channel Angles for Implants with Titanium Bases

If the implant is not directly connected to the restoration and uses a titanium basis, the screw channel emerges from the top of the titanium base's connection geometry. Note that this connection geometry also includes the cement gap between restoration and titanium base.

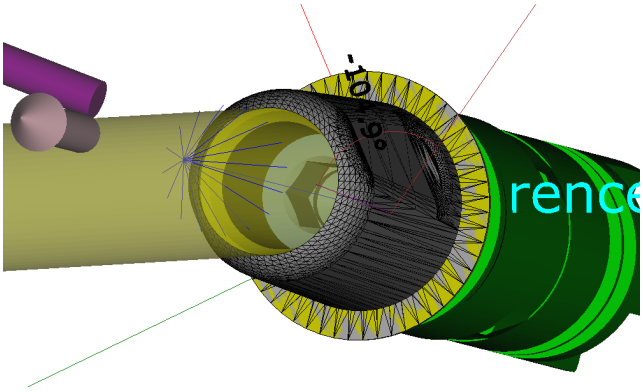


Figure 24: Implant with titanium base, screw channel angle 15°

### 4.13.3 Setting Screw Channel Angles for Implants Where the Angulation Starts Not From the Top of the Connection Geometry

If your titanium base or other abutment geometry has an angulation starting point that is below the top of the connection geometry, a different connection geometry is needed. See an example in Figure 25. Note that it is important to set a fixed angulation for this type of geometry. User-defined screw channel angulations that are fixed to one direction / angulation plane are currently not possible. [1]

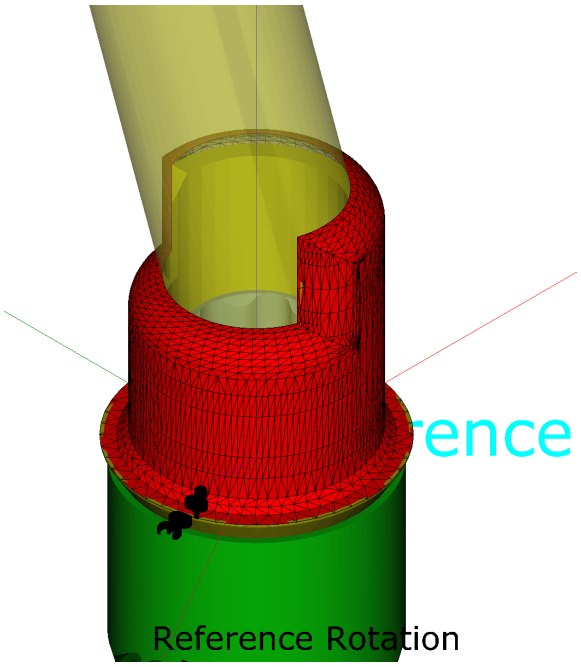



Figure 25: Implant with open boundary curve, fixed screw channel angle 15°

For more information regarding custom angulations, contact the exocad support team.

[1] If you require further details on the handling of open boundary curves with screw channels, please contact the exocad support team.



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## 4.14 Step 13: Fill in Optional Information

See Chapter 6 for a list of available optional information. Fill in this information, if applicable.

## 4.15 Step 14: Define the Library Compatibility

IMPORTANT

The implant connections define the library compatibility. This information is needed to enable designing with your library components on compatible exoplan implants within our Immediate Load workflow. Without this definition, the library entry cannot be referenced to the corresponding exoplan implant. We strongly recommend defining the library compatibility..

To define the library compatibility, expand the section LIBRARY COMPATIBILITY in the Information Section of an implant subtype.

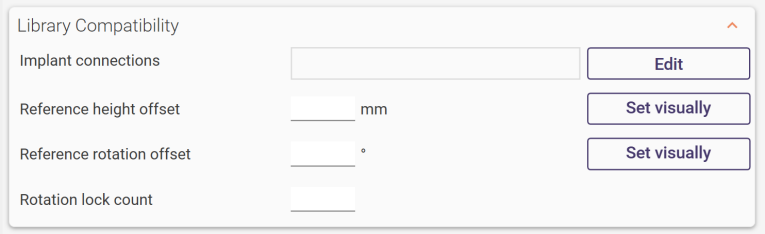


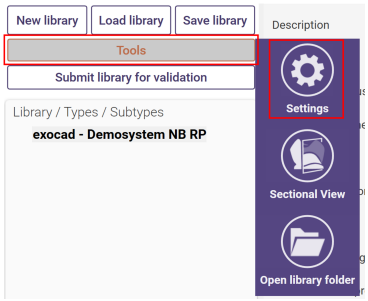

Figure 26: LIBRARY COMPATIBILITY section

For editing the library compatibility, you must specify the directory of your DentalCAD application in the exoImplantEditor settings. This enables the exoImplantEditor to derive connection keywords from the DentalCAD. To specify the directory:

**Step 1:** Click TOOLS in the Action/Hierarchy Section of the exoImplantEditor window, then select SETTINGS.

**Step 2:** In the SETTINGS window, click the search symbol on the right.

**Step 3:** Select the DentalCAD installation directory in the appearing dialog.




### 4.15.1 Defining Implant Connections

To use the Immediate Load feature, keywords ("connectionIDs") must be implemented. These keywords are used to make the exocad prosthetic libraries compatible with the exoplan implant libraries. Different components that share the same connection and are considered "compatible" use the same connection keyword. The connectionID keywords are initially defined by exocad staff in the exoplan implant libraries.

To be able to see all of the currently supported connectionIDs, you have to install all exoplan libraries onto your system. You can download the most up-to-date exocad libraries using our download portal at exocad.com/integration .

Click EDIT next to the IMPLANT CONNECTIONS field to open the EDIT COMPATIBILITY KEYWORDS window.



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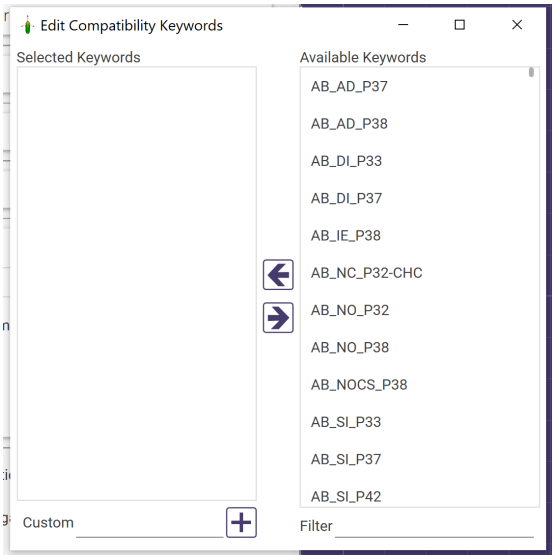



Figure 27: Edit Compatibility Keywords window

Available connection keywords appear in the Available Keywords list. The Selected Keywords list shows the selected keywords for the current library entry. Move items from one list to the other using the arrows between the lists. Hold CTRL to mark several entries. Filter the list of available keywords by typing into the field Filter.

IMPORTANT

If you want to define a connectivity between your exocad DentalCAD libraries and compatible implant libraries, contact the exocad support team. Do not create custom keywords for your libraries. In case you need a complete overview of existing keywords, request a list from exocad. ConnectionIDs that are not defined in an already existing exoplan library will be disregarded and deleted by exocad staff during the checking and finalization process.

### 4.15.2 Reference Offset Values (Height, Rotation)

The fields Reference Height Offset and Reference Rotation Offset define the position of the component's coordinate system in relation to a reference coordinate system. The reference coordinate system serves to determine a common reference orientation for the component and abutments or other parts that can be connected to the component.

**Reference Height Offset**

Reference Height Offset is the distance between the origin of the component's coordinate system and the origin of the reference coordinate system along the occlusal axis. It is defined by placing a so-called Reference Point. This Reference Point is the origin of the reference coordinate system. Depending on the connection geometry type, the Reference Point must be set at different positions of the component's connection geometry.

Reference Point for **external connection** geometries (on level of the outer flat ring):



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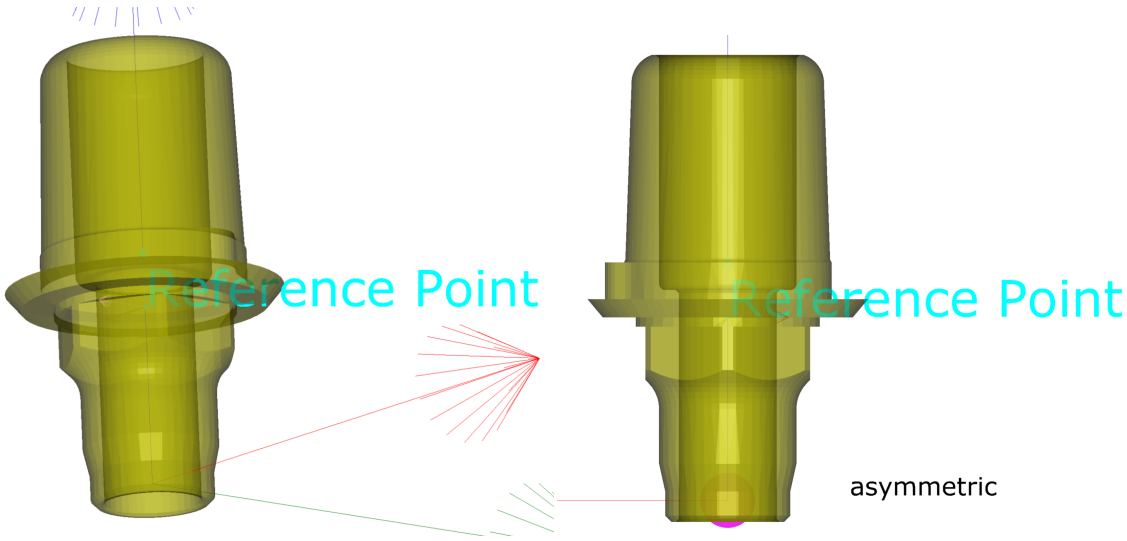



Figure 28: Reference Point for external connection geometries

Reference Point for **internal connection** geometries (on level of outer flat ring):

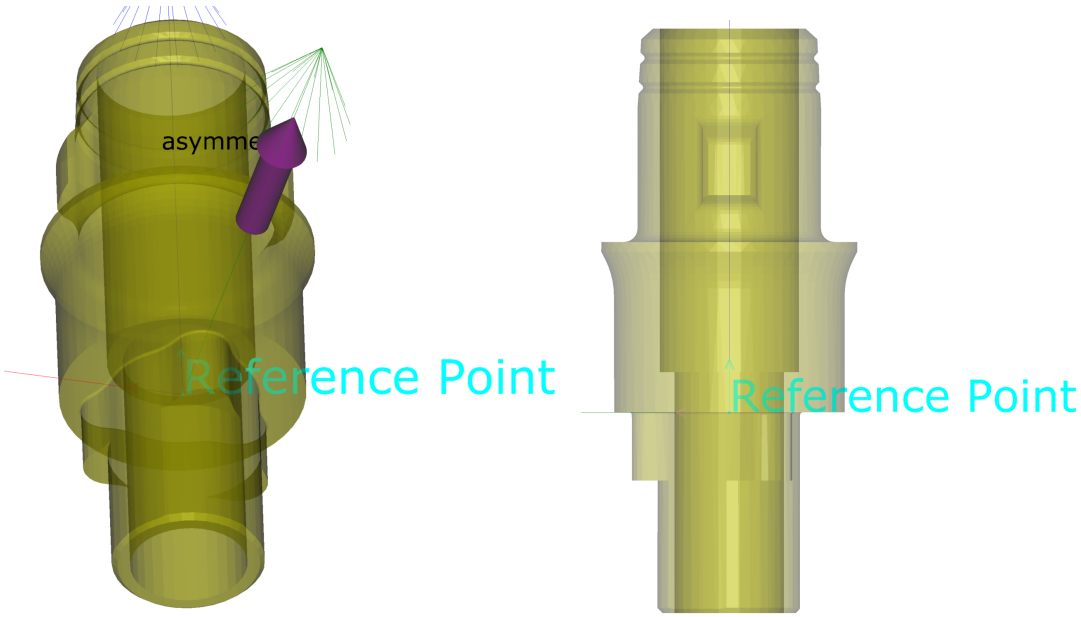
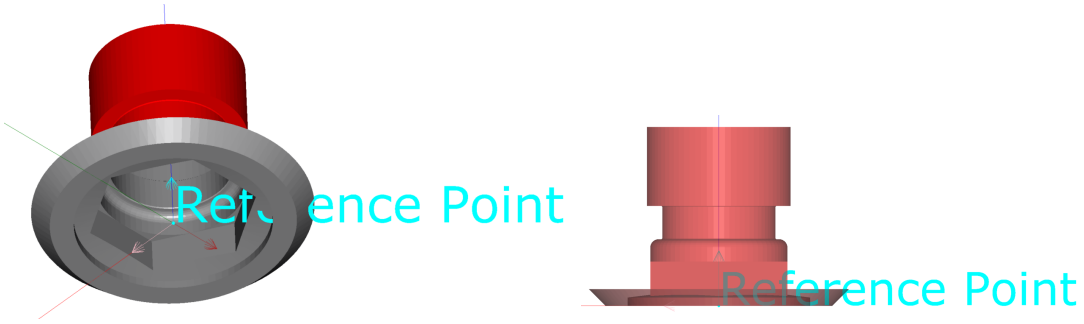



Figure 29: Reference Point for internal connection geometries

Reference Point for **internal connection flex and straight** geometries:



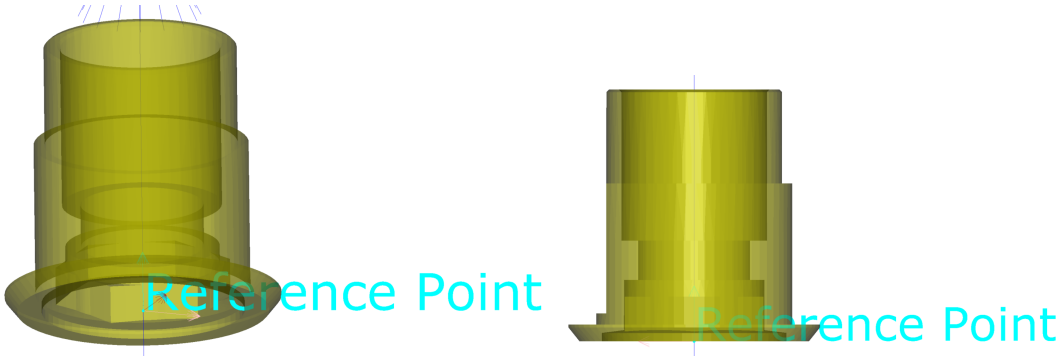
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(a) flex (b) straight

Figure 30: Reference Point for internal connection flex/straight geometries

Reference Point for **internal connections with titanium bases, flex and straight** geometries:




(a) flex (b) straight

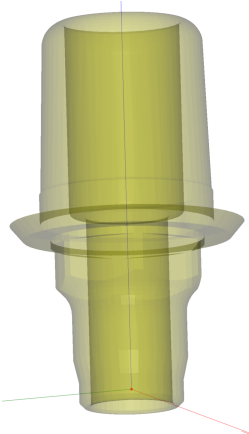
Figure 31: Reference Point for internal connections with titanium bases, flex and straight geometries

If the origin of the component's coordinate system is exactly at the same height as the Reference Point, there is no height offset between the component's coordinate system and the reference coordinate system. In this case, enter the value 0 into the REFERENCE HEIGHT OFFSET field. For component systems where the connection geometry is morse taper, the RREFERENCE HEIGHT OFFSET must be defined by exocad staff.

For component meshes where the coordinate system's origin is not on the same level as the Reference Point, define the Reference Height Offset by entering a value into the REFERENCE HEIGHT OFFSET field or by setting it visually.

To set the Reference Height Offset visually:

**Step 1:** Set the mesh to transparent (see Chapter 3.3.2), in order to view the component's coordinate system.

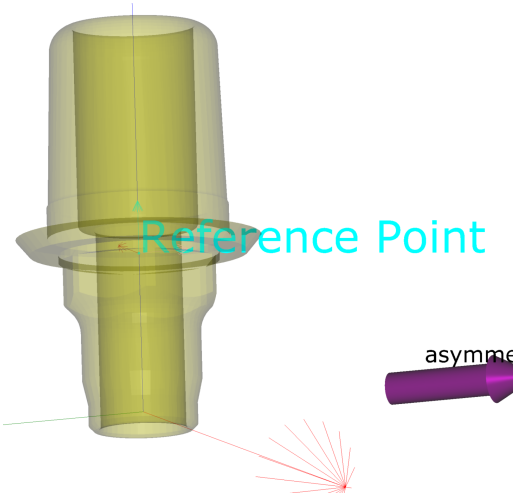


**Step 2:** Click SET VISUALLY next to the REFERENCE HEIGHT OFFSET field. The mouse cursor changes to a hand symbol.



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**Step 3:** In the View Section, click where the reference point must be set, according to the rules given previously for the connection types. The Reference Point (origin of the reference coordinate system) is now set at the position on the occlusal axis which is at the same height as the point you clicked on. This means, you do not have to click exactly the point on the occlusal axis. You must only select a point which lies at the correct height.




**Reference Rotation Offset**

This value shows how much the orientation of the connection's rotation lock deviates from the orientation in the reference coordinate system. The orientation of the rotation lock is defined by a vector perpendicular to the occlusal axis. This means, the orientation is located along one of the two not-occlusal axes in the coordinate system.

There are three categories of rotation locks:

- **Category 1**: For component systems where the rotation lock is a regular polygon (or part thereof), the orientation vector must be located congruent to one of the polygon's corners. This defines the vector's orientation for components with hexagonal, octagonal, or square rotation lock. This is valid for internal and external connections. Figure 32 shows the orientation of the rotation lock for polygons in internal and external hex connections.

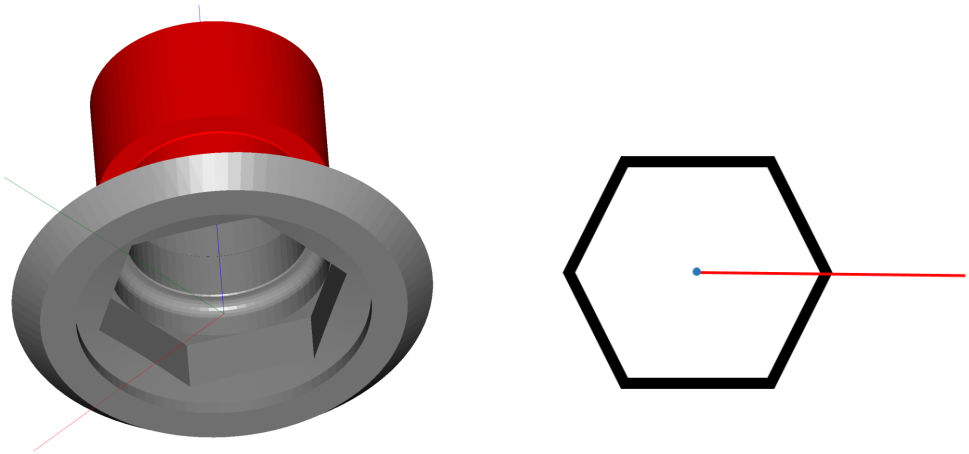


Figure 32: Orientation of rotation lock - category 1

- **Category 2**: For component systems where the rotation lock is not a regular polygon, the shape is approximated by a polygon and then treated as in category 1. Figure 35 illustrates this approach, showing the assumed polygon as a red shape.



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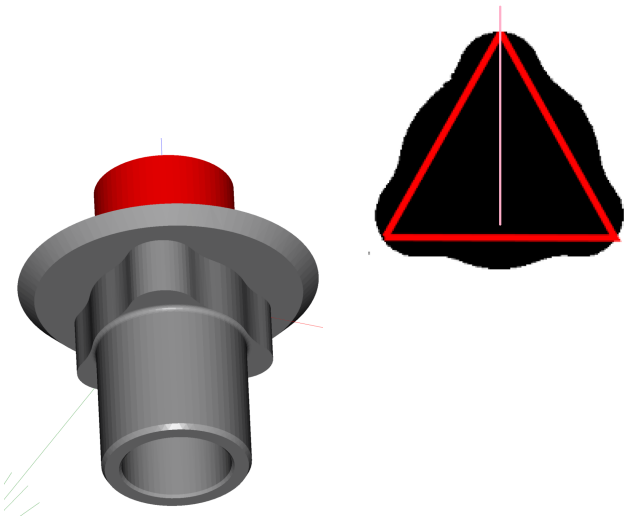


Figure 33: Orientation of rotation lock - category 2

- **Category 3**: For component systems where the connection geometry is morse taper, the rotation lock is the polygon shape beneath the round shape at the upper side of the component. The rotation offset definition is based on the polygon shape and treated as category 1.

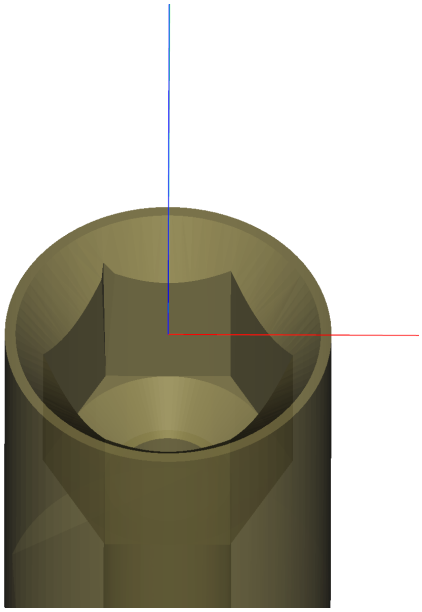


Figure 34: Orientation of rotation lock - category 3

To define the Reference Rotation Offset value:

**Step 1:** Ensure that the Reference Height Offset is defined, and that the reference coordinate system is visible. If necessary, adjust the transparency settings for the component mesh (see Chapter 3.3.2) so that you can view the rotation lock's corners clearly.

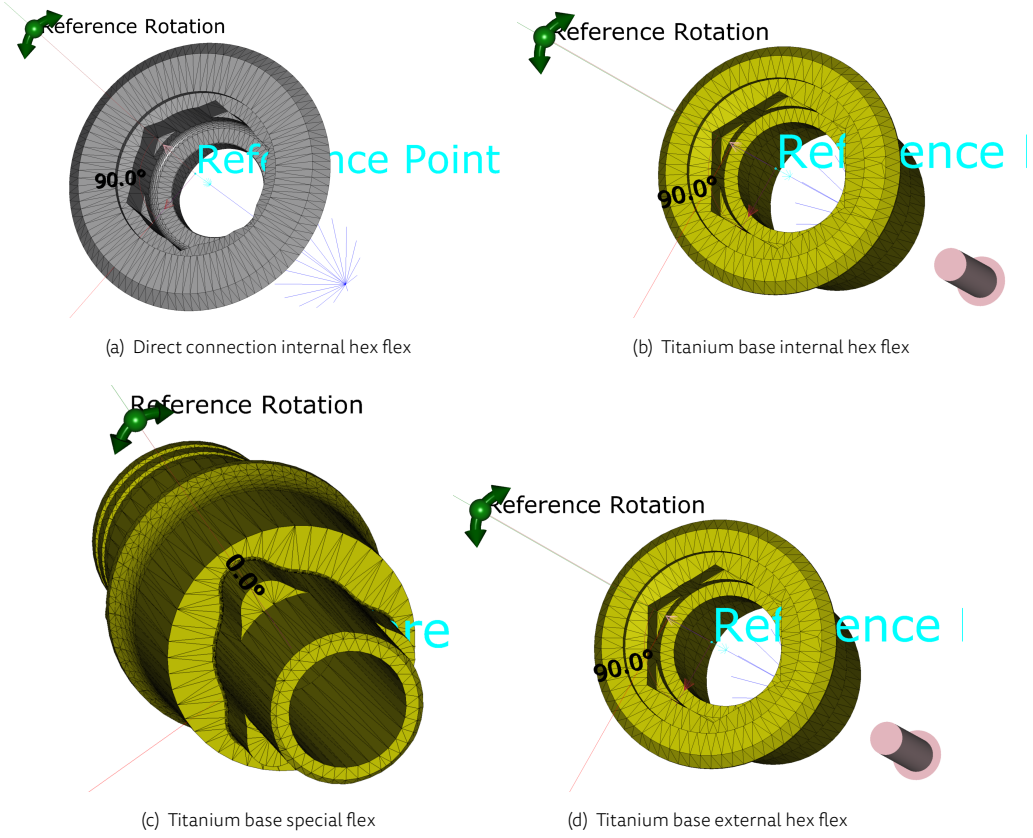
**Step 2:** Click Set Visually next to the field Reference Rotation Offset. The mouse cursor changes to a hand symbol, and the wireframe is displayed. When you hover the mouse over the implant mesh, a red dot is displayed.

**Step 3:** For a rotation lock of category 1, move the red dot onto a corner of the rotation lock.
For a rotation lock of category 2, move the red dot onto a corner of the assumed polygon shape.



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For a rotation lock of category 3, move the red dot onto a corner of the polygon shape beneath the round shape on top of the implant.




(a) Direct connection internal hex flex

(b) Titanium base internal hex flex

(c) Titanium base special flex

(d) Titanium base external hex flex

Figure 35: Reference Rotation Offset

**Step 4:** Click to confirm the dot's position. The reference coordinate system is rotated to fit the defined orientation of the rotation lock. The reference rotation is displayed as a new axis, with a green sphere at the arrowhead. To change the reference rotation, click this sphere and drag it to the desired position.
The angle measure is displayed between the axis position of the component and the reference rotation axis. This value is also displayed in the REFERENCE ROTATION OFFSET field.

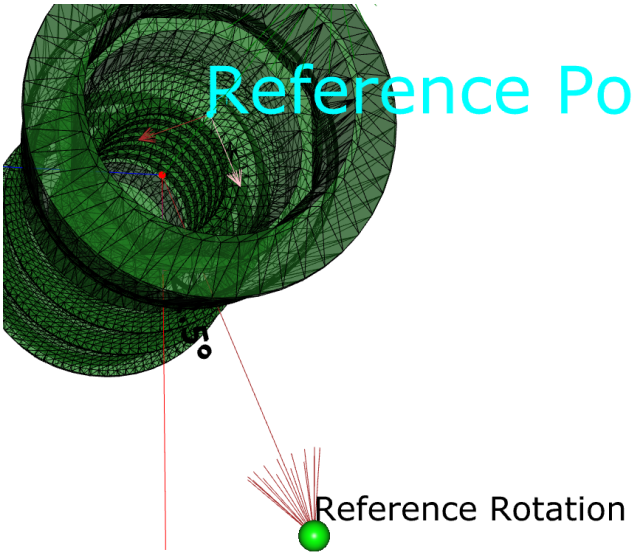



Figure 36: Reference rotation offset result



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Besides defining the rotation offset value visually, you can also type it into the field Reference Rotation Offset. If one of the edges of the rotation-lock lies exactly on an axis of the reference coordinate system, type in 0. For all components without rotation lock, type in 0.

INFORMATION

For height and rotation offset values, small measurement inaccuracies are negligible. Values rounded to two decimal digits are sufficient.

### 4.16 Step 15: Define the Secondary Library Compatibility (Angulated Implants) - Currently Not Available

Currently the software does not support part angulation.

## 5 How to Create Implant Libraries with Multiple Entries

You can add implant types and implant subtypes to create a library with multiple entries. The hierarchic library structure with types and subtypes is displayed in the Actions/Hierarchy Section (see Figure 37).

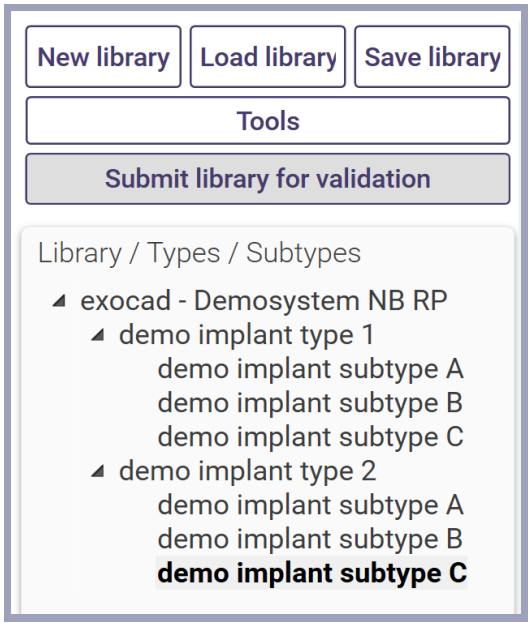



Figure 37: Example library with multiple entries

Parameters are automatically transfered from higher levels to lower levels in the library hierarchy. If you set a parameter on type level, it will be applied for all subtypes within this type that do not overwrite the parameter. If you set a parameter on subtype level, it will only be set for this subtype. If you define a parameter on type/subtype level, it will not be overwritten if you enter a different parameter on a higher level.

### 5.1 Add an Implant Type

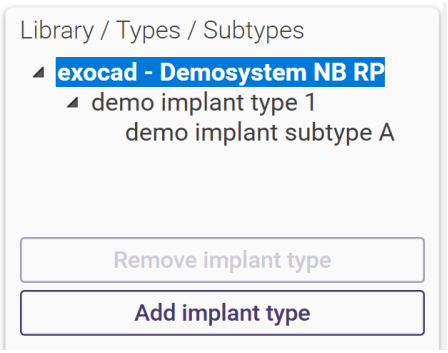
exocad recommends to use the platform diameter as implant type.

**Step 1:** Select the implant library in the Actions/Hierarchy Section.

**Step 2:** At the bottom of the Actions/Hierarchy Section, click Add Implant Type.



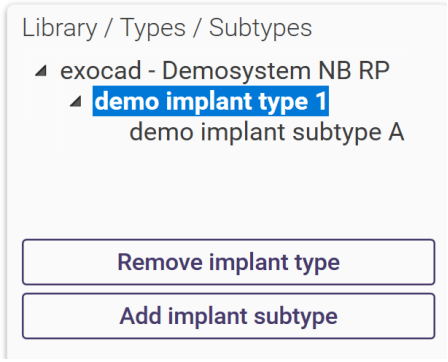
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### 5.2 Add an Implant Subtype

**Step 1:** Select an implant type in the Actions/Hierarchy Section.

**Step 2:** At the bottom of the Actions/Hierarchy Section, click ADD IMPLANT SUBTYPE.




To delete an implant type/subtype, click REMOVE IMPLANT TYPE/SUBTYPE.

Enter information for the implant library/type/subtype in the corresponding Information Sections.

INFORMATION

You can store multiple scanbodies for an implant type using subtypes. For example, if you want to store an intraoral scanbody and a desktop scanbody, create two subtypes for an implant type. Load the scan body meshes using the SCAN ABUTMENT field.

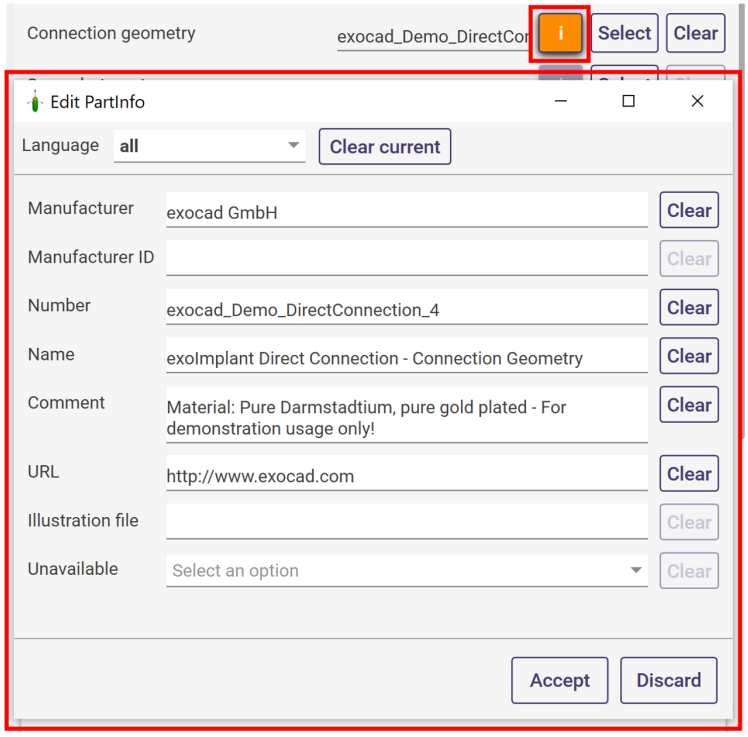
## 6 Optional Information

### 6.1 Part Information

For every loaded mesh representing a physical component (not for dummy meshes), you can enter part information by clicking the **i** button where you have loaded the mesh. If part information is already available, this button is displayed in orange and the information appears when hovering over it.



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| Field | Explanation |
|---|---|
| LANGUAGE | By default, **all** is selected. This means, the part information is displayed for the user if no language-specific record is available for the user's language. You can add language-specific records by selecting another language and typing in the information for this selected language. Languages with records appear bold in the Language list. |
| MANUFACTURER | Component manufacturer. |
| MANUFACTURERID | Abbreviation of the component manufacturer. exocad provides a list of manufacturer abbreviations upon request. |
| NUMBER | Order number of the component. |
| NAME | Short part description as it is called in the catalog. |
| COMMENT | Material and surface information (enter as follows: Material: XY; Surface: XY; additional comments) and additional information. |
| URL | URL of the component manufacturer's website. |
| ILLUSTRATION FILE | You can store an image file, e.g. a realistic image of the component, in the library folder and type the image filename into this field. Note that at the moment this feature is not used at any point in the software. |
| UNAVAILABLE | This parameter is used only in specific cases. Typically you can leave it empty. |

From the part information, the exoImplantEditor creates the `.partInfo` file. This file is stored in the library folder. When sending a library to exocad for signing, this file will be part of the validation process. Please do not change the filename of any `.partInfo` file!



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## 6.2 Optional Meshes

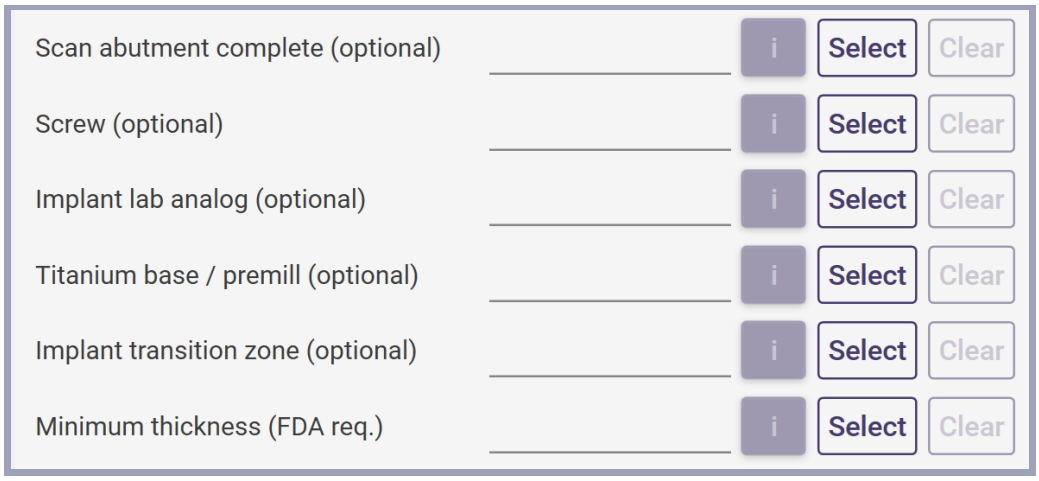
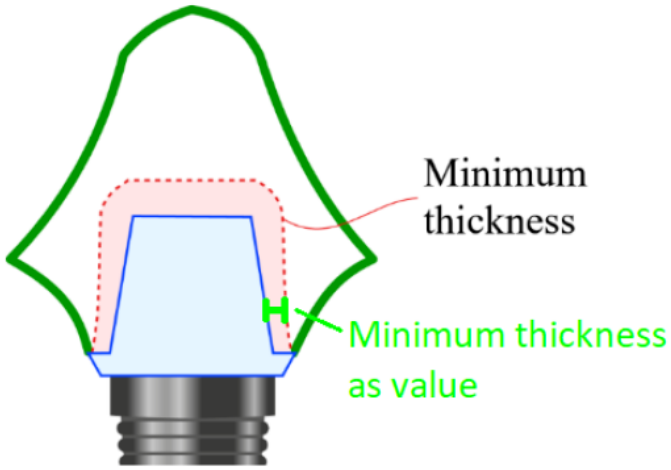



Figure 38: Options to load additional (optional) meshes

You can load meshes for the following elements:

- Scan abutment complete: volumetric mesh of the complete scan body (blue visualization in the screenshot displays half-complete scan abutment)
- Screw: mesh of the screw (gray visualization)
- Implant lab analog: mesh of the implant lab analog or of the real implant geometry (green visualization)
- Titanium base / premill (see Chapters 4.10 and 4.11)
- Implant transition zone: mesh of the transition zone between the implant connection platform and the premill abutment collider (if defined, see Chapter 4.11.2). Please contact exocad support if you want to use a mesh for the implant transition zone.
- Minimum thickness (FDA req.): hull curve between implant connection platform and screw channel around the support geometry. This minimum thickness can not be violated during the design process in the DentalCAD. Please contact exocad support if you want to use a mesh for the minimum thickness.
  If you load a mesh for minimum thickness, an additional element MINIMUM THICKNESS AS VALUE appears. This value should approximate the minimum thickness represented by the minimum thickness mesh. You can type in a value or measure the value visually.




To load a mesh, click the corresponding SELECT button. Select the stl file you want to load in the file selection window. Figure 39 shows the mesh visualizations.



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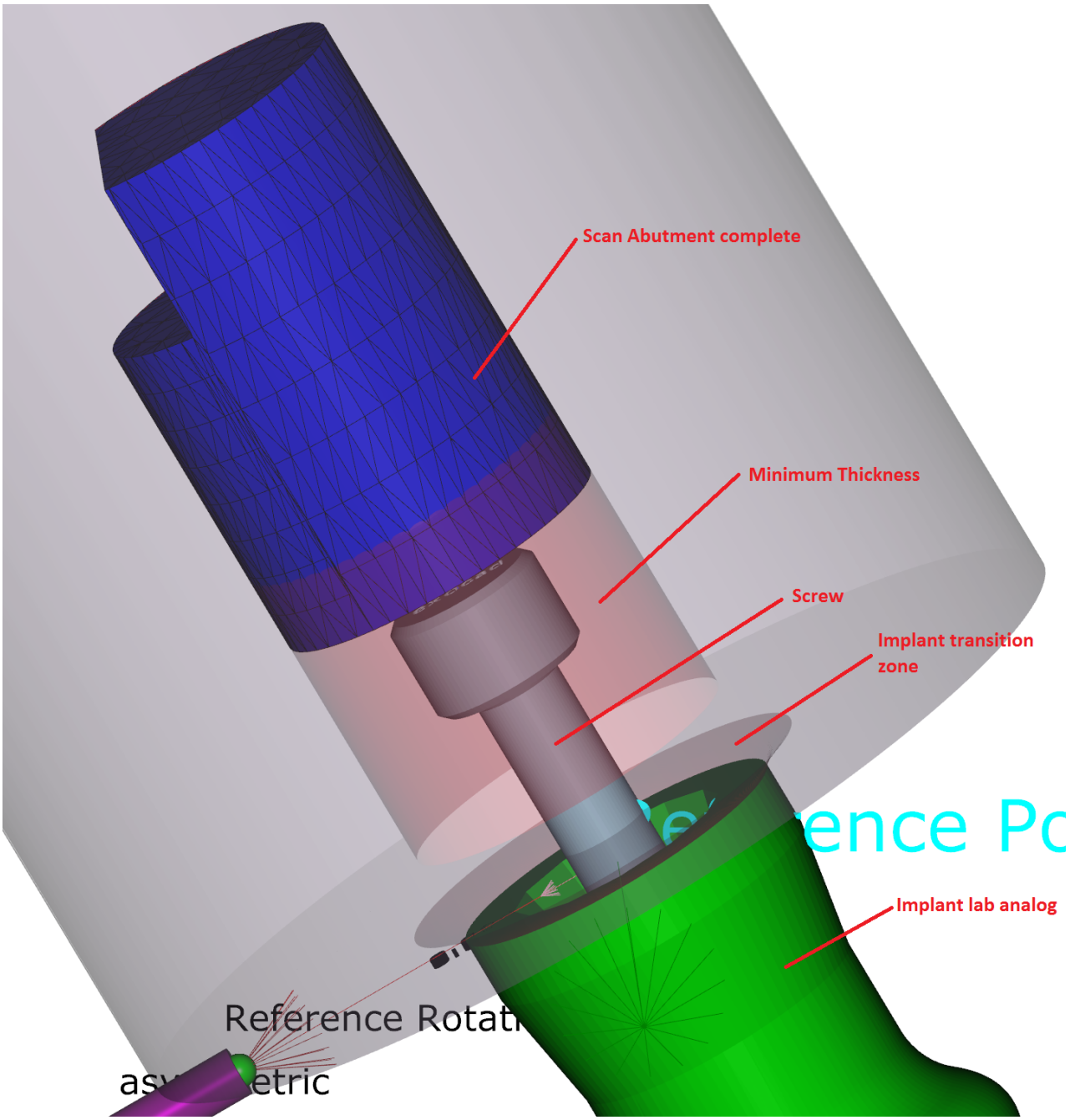
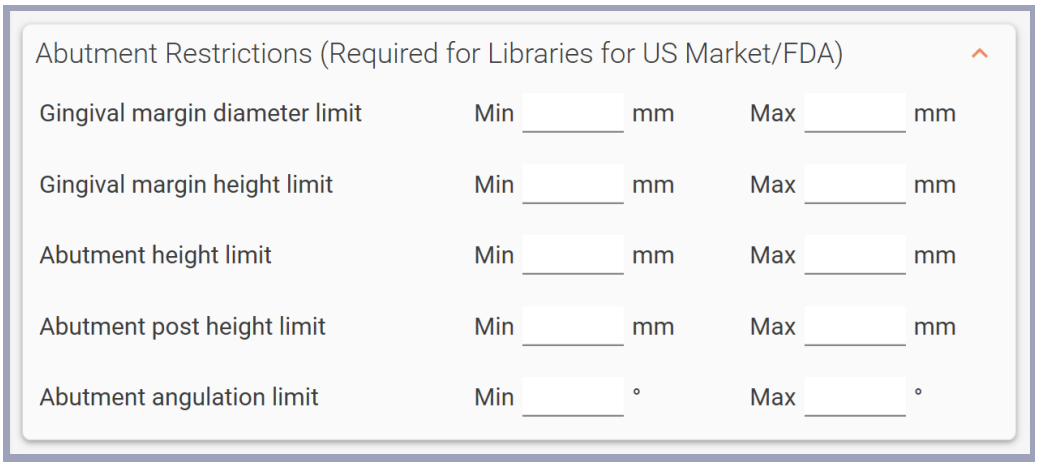



Figure 39: Visualization of optional meshes



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### 6.3 Abutment Restrictions (Required for Libraries for US Market/FDA)

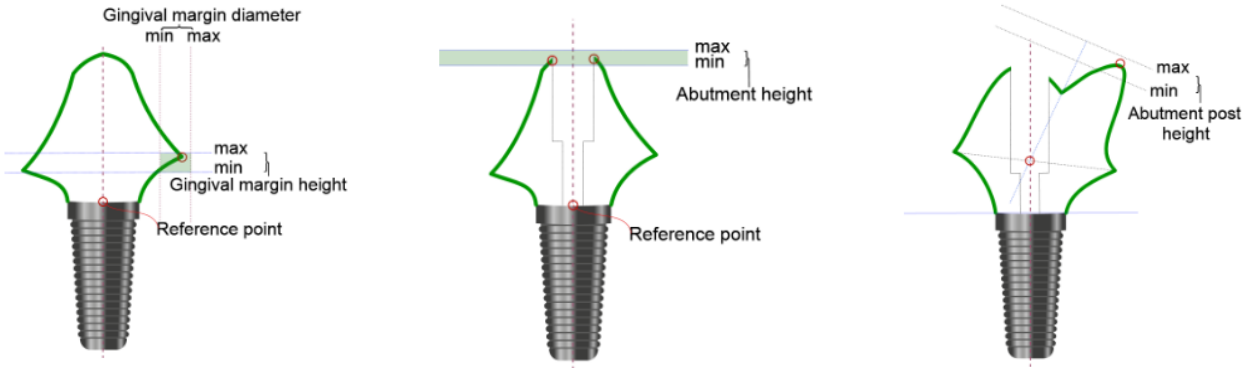



You can define restrictions for abutments connected to the top of the implant, in order to avoid misfitting or damages to implants and/or abutment parts. You can define abutment restrictions on any level, depending on if you want to define restrictions for all implant types and subtypes (library level), for specific implant diameters (implant type level), or for specific implant lenghts (implant subtype level).

For the following abutment measures, you can set a minimum and/or a maximum value:

- Gingival margin diameter limit: horizontal measure from reference point (origin) to the abutment's outer edge.
- Gingival margin height limit: vertical measure from reference point (origin) to the gingiva's highest point.
- Abutment height limit: height of the abutment.
- Abutment post height limit: vertical measure from the top of the abutment to the abutment shoulder.
- Abutment angulation limit: possible angulation of the abutment.

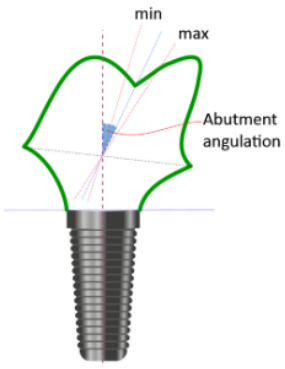
Figure 40 illustrates these measures. The graphics are also displayed when you hover the mouse over the corresponding value description texts.




(a) (b) (c)



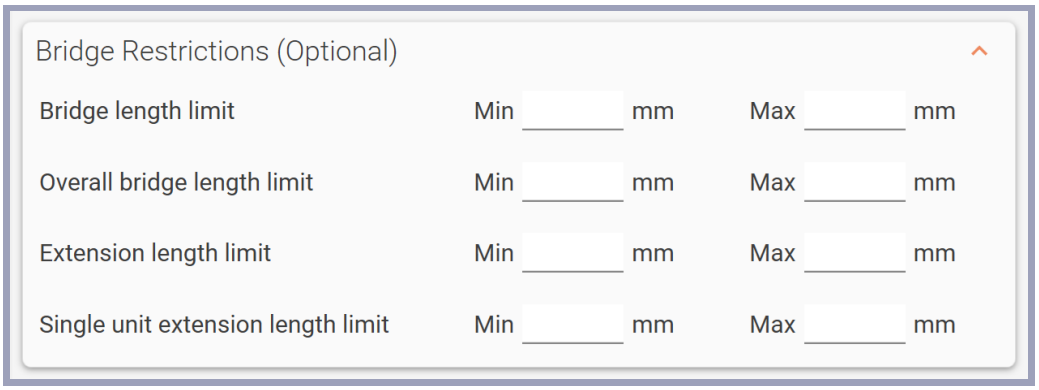
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(d)

Figure 40: Abutment restriction measures

## 6.4 Bridge Restrictions




You can define restrictions for bridge constructions on any level, depending on if you want to define restrictions for all implant types and subtypes (library level), for specific implant diameters (implant type level), or for specific implant lenghts (implant subtype level).

For the following bridge measures, you can set a minimum and/or a maximum value:

- Bridge length limit: Measure from one implant to the next implant in a bridge.
- Overall bridge length limit: Measure of the complete bridge including extensions.
- Extension length limit: Extension length if the bridge is supported by two or more implants.
- Single unit extension limit: Extension length if the bridge is supported by only one implant.

Figure 41 illustrates these measures. This graphic is also displayed when you hover the mouse over the value discription texts.



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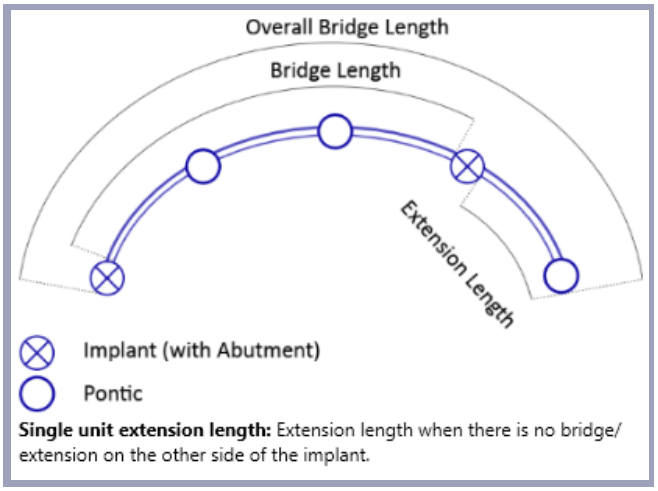



Figure 41: Graphic showing bridge restriction measures

INFORMATION

A bridge extension is the free-hanging part of the bridge which is not supported by an implant on both sides. Free extensions can have a stronger leverage effect on the implant.

## 7 Saving/Loading a Library

To save a library, click SAVE LIBRARY in the Action/Hierarchy Section of the exoImplantEditor window. When saved, the exoImplantEditor automatically validates the library. If there are errors, those will be listed in a separate window. Only an error-free library will be saved successfully.
To load a library, click LOAD LIBRARY and select the `config.xml` file of the library you want to load. Alternatively, drag and drop the `config.xml` file onto the exoImplantEditor window.



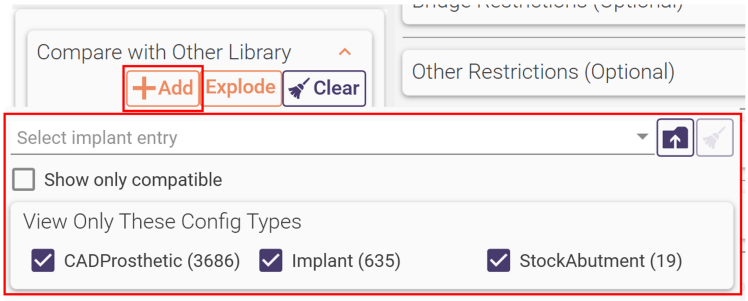



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# 8 Comparing Libraries

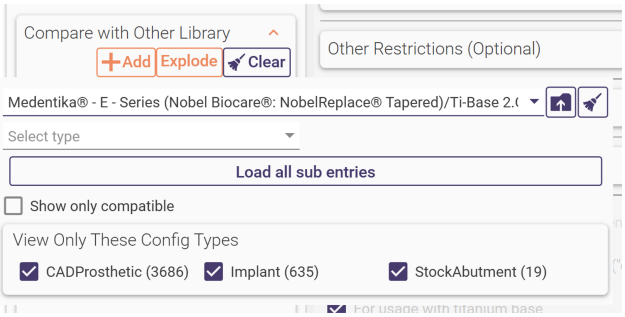
Using the COMPARE WITH OTHER LIBRARY function, you can compare a library with other libraries, e.g. stock abutment libraries, to determine if a connection part fits an implant properly. Furthermore, comparing your implant library to a connection part allows you to determine if the compatibility settings for your implant library are correct.

**Step 1:** Select an entry in the lowest level of your library and expand COMPARE WITH OTHER LIBRARY at the bottom of the Action/Hierarchy Section.




**Step 2:** Click SELECT IMPLANT ENTRY and select a library from the dropdown list. The list shows available libraries within your exocad installation.
***Note:*** In order for these libraries to be available in the list, the directory of your DentalCAD installation must be selected in the SETTINGS. If you want to compare to a library that is not stored within your DentalCAD directory, click the folder icon and select the `config.xml` file of the library.

**Step 3:** Click SELECT TYPE and, successively, SELECT SUBTYPE to select the library type and subtype relevant for your comparison. You can also select to LOAD ALL SUB ENTRIES, which will load all types and subtypes of the selected library.




Activate SHOW ONLY COMPATIBLE to show only compatible libraries. To view only specific library types, check the corresponding checkboxes in the VIEW ONLY THESE CONFIG TYPES section.

Once you have specified the items for your comparison, the selected geometries are displayed together in the View Section. If both libraries are correctly set up, they are displayed in correct reference to each other. The COMPARE WITH OTHER LIBRARY section is extended.



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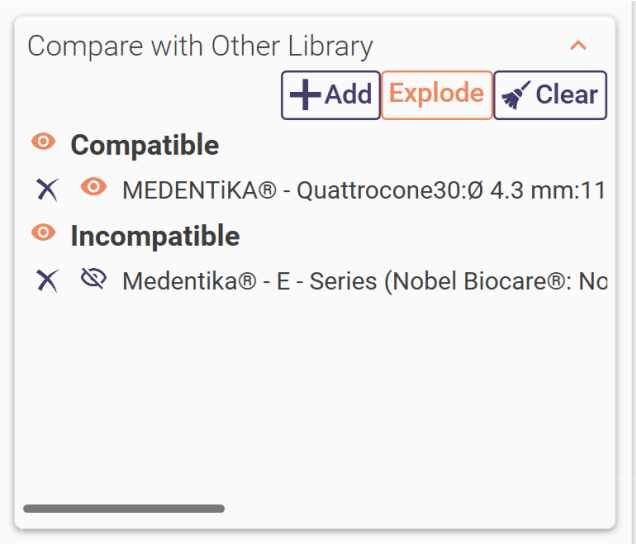



Figure 42: Extended COMPARE WITH OTHER LIBRARY section

- Compatible and incompatible libraries are displayed as two separate lists. The compatibility refers to the currently selected entry in the Hierarchy section and updates automatically when selecting another entry. You can select further libraries to be added and can switch from one library to the other in the list. Remove libraries from the list using the x symbol.
- By default, EXPLODE is active and the library geometries are displayed side-by-side in the View Section. If you uncheck, they are displayed at the same location.
- Use the eye symbols to show/hide the library geometries in the View Section.
- Click CLEAR to clear libraries from the list. Clicking INCOMPATIBLE removes incompatibale libraries (libraries not matching the parameters defined in the library compatibility settings). Clicking ALL removes all libraries.

## 9 Signing a Library

IMPORTANT

We strongly recommend not to use libraries which have not been checked and signed by exocad. If you use libraries which have not been signed, this happens at your own risk. exocad only guarantees the compatibility of signed libraries.

Integrating, signing and encrypting a library leads to it being officially accepted by exocad's software products and being officially available in our online library portal **exocad.com/integration/overview** for download. If you use a library which has not been signed by exocad, a warning message will appear in the application when selecting the corresponding library.

Clicking SUBMIT LIBRARY FOR VALIDATION in the Actions/Hierarchy section initiates a priliminary check of the library data. If the exoImplantEditor detects errors, these will be listed in a separate window. Only error-free libraries can be sent to exocad for signing. If no errors were detected by the exoImplantEditor, clicking SUBMIT LIBRARY FOR VALIDATION opens the website **exocad.com/implantdata**, which contains information and policies for submitting a library to exocad. Additionally, a zip folder with the library data is automatically created and stored on your desktop. Follow the instructions on the website for sending the library to exocad for signing.



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### 9.1 Check It Before You Regret It

Before sending your library to exocad for signing, please check the items in the following

**Final Library Checklist:**

- Have you correctly followed the naming conventions for implant library folders? Refer to Chapter 4.1.
- Have you correctly followed the naming conventions for library descriptions? Refer to Chapter 4.2.
- Do the mesh files of your library have correct filenames according to the conventions? Refer to Chapter 2.1.
- Have you filled in the fields Supplier Name and Supplier Link for the library? Refer to Chapter 4.12.
- Ensure to create a zip-compressed folder for your library, for sending to exocad.

## 10 Support

We provide third-level support to our partners in case of technical questions/issues related to our products, usage of the software, exoportal, etc. You can contact our support team to request quick online demonstrations of new features demonstrated by application specialists.

As a certified company (ISO 13485), we document support issues and the given solutions or results. To contact our support team, please send a request to your region's respective email address. Your email will automatically create a ticket in our support system. You will receive a ticket number along with the automatic response email. Our support team will contact you by email or by phone.

To follow up, please keep your ticket number ready. A convenient way to follow up is to reply to our ticket response email. Without a ticket number, we cannot handle your request (especially when making contact via Skype). Thank you for your understanding.



IMPORTANT

**To resolve your issue quickly and smoothly:**

- Send a separate email for each issue. Please do not introduce new topics to an existing email conversation!
- Do not modify the subject line of the support reply email!
- Provide all necessary data (project file, scan data, construction files) and additional information (software build number, OS, etc). Without this data, we cannot reproduce a problem (technical or usage) and therefore, we cannot handle it!

To view the support contact details of your support region, visit **exocad.com/secure-area/technical-and-software-support**.



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